

**LOS ANGELES COUNTY
WIRELESS E9-1-1 TRIAL**

**STATE OF CALIFORNIA
DEPARTMENT OF GENERAL SERVICES
TELECOMMUNICATIONS DIVISION**

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Executive Summary

Dialing 9-1-1 is the most familiar and effective way for the public to obtain help in an emergency. In 1998 more than 19 million 9-1-1 calls were made in California and that number is expected to grow to 23 million in the next 2 years. Much of the anticipated growth will come from callers using wireless telephones.

Today, a community of state and local government agencies dedicated to saving lives and protecting property provide 9-1-1 services throughout California. Rapid advances in technology, increasing population and explosive growth in wireless telephone usage challenge the ability of this community to deliver the highest quality 9-1-1 service available. Meeting the challenge will require strategic planning that considers emerging technologies, mandates, funding mechanisms, and the continuing impact of deregulation of the telecommunications industry. The Los Angeles Wireless E9-1-1 Trial represents an important step in the state's ongoing dedication to the excellence of its 9-1-1 system.

Background

The state of California is committed to providing the public the highest quality 9-1-1 service available regardless of the calling medium. The 9-1-1 system currently in use was originally conceived, designed and implemented in the 1960s, an era when wireline telephones constituted the only widespread commercial telephone service. In the intervening years, wireline 9-1-1 services have profited from many advances in telecommunications technology. In the 1990s, wireless telephones have become widely used. With the proliferation of wireless telephones has come the recognition that wireless 9-1-1 callers must be provided the same enhanced level of service enjoyed by their wireline counterparts.

Basic and Enhanced 9-1-1

Nine-one-one calls are usually routed by local exchange carriers (LECs) to Public Safety Answering Points (PSAPs) staffed by call takers trained to assist callers seeking emergency assistance. Call takers direct calls to law enforcement, fire and medical emergency responders.

In the basic form of 9-1-1, the PSAP call taker obtains necessary information about the nature and location of the emergency by questioning the caller. Over the past decade, there have been a number of technological improvements that promote more efficient and rapid emergency response. These improvements are collectively referred to as "enhanced 9-1-1 or E9-1-1". When a 9-1-1 call is placed using a wireline telephone, the call, along with the caller's telephone number and location, is automatically routed to the most appropriate PSAP.

E9-1-1 affords three significant advantages to emergency services personnel:

- Automatic Number Identification (ANI) provides the call taker with the ten-digit telephone number to call back in the event the call is disconnected.

- Automatic Location Identification (ALI) permits immediate dispatch to emergency locations even in instances where callers are incapacitated or do not know their location. ALI helps personnel dispatched to the emergency site to quickly find its location.
- Where the area served by a LEC central office encompasses areas served by more than one PSAP, ALI permits Selective Routing (SR) of a 9-1-1 call to the PSAP having jurisdiction at the location of the emergency.

E9-1-1 in California

Currently, all wireline 9-1-1 calls placed in California are answered at one of the approximately 500 PSAPs operated by public safety agencies. E9-1-1 functionality is available throughout the state for 9-1-1 calls placed on wireline telephones.

By law, all wireless 9-1-1 calls placed in California are answered at one of the 24 PSAPs operated by the California Highway Patrol (CHP). The CHP, which has jurisdiction on freeways, state highways, and county roads and in unincorporated areas, forwards calls not within its jurisdiction to the appropriate local PSAP. Within the state, only basic 9-1-1 functionality is available for 9-1-1 calls placed on wireless telephones.

Los Angeles Wireless E9-1-1 Trial

The Los Angeles Wireless E9-1-1 Trial had its genesis in actions taken by both the state and federal government to ensure quality and reliability of 9-1-1 services.

FCC Order #94-102

In July 1996, the Federal Communications Commission (FCC) issued Order and Notice of Further Proposed Rulemaking (NPRM) on docket #94-102 (hereafter referred to as the “FCC Order”)¹. The FCC Order instructs wireless carriers to make significant improvements to their 9-1-1 products and services by implementing “enhanced 9-1-1” or “E9-1-1”.

The FCC recognized that wireless technology creates complexities for 9-1-1 service that are absent from wireline 9-1-1. To accommodate the technological and policy issues involved, the FCC Order provided for a two-phase implementation over the five-year period from October, 1996, to October, 2001. The principal difference between the two phases lies in the precision of caller location information provided to PSAPs by wireless carriers.

FCC Order Phase I requires that, not later than April, 1998, wireless carriers complete actions necessary to enable them to supply the location of the cell site or base station receiving the wireless 9-1-1 call. In urban areas, identification of the receiving cell site generally places the caller within a 1 to 3 square mile area. In

¹ The Executive Summary of the FCC Order is included as Appendix A.

rural locations, cells are usually less densely placed and the area covered by a cell may be considerably larger.

FCC Order Phase II requires that, not later than October, 2001, wireless carriers must achieve the capability to identify the latitude and longitude of wireless 9-1-1 callers within parameters specifying a minimum acceptable level of accuracy.

Wireless 9-1-1 Task Force

Also in 1996, the Business, Transportation and Housing Agency formed the Wireless 9-1-1 Task Force to identify and analyze 9-1-1 issues and formulate recommendations to make 9-1-1 more viable, efficient and effective. The Task Force recommended that the state conduct pilot programs to evaluate the efficacy of implementing the FCC Order prior to deciding on a particular course of action.

Executive Order W-186-98

In response to the Task Force's recommendations, Governor Wilson issued Executive Order W-186-98² instructing the Department of General Services (DGS) and the California Highway Patrol to implement the FCC Order "to the fullest extent authorized by law and as rapidly as technologically possible". The Executive Order further instructed DGS to "promote technological improvements in the E911 system to maintain the most efficient and cost effective public safety services available".

Los Angeles Wireless E9-1-1 Trial

In 1997, a consortium, which included the California Highway Patrol, the DGS's Telecommunications Division, six cities in the San Gabriel Valley, four wireless carriers and two 9-1-1 service providers, began the Los Angeles Wireless E9-1-1 Trial. The trial's primary objective was to investigate the feasibility and potential benefit of deploying FCC Order Phase I enhancements in California. The trial officially ended on January 31, 1999.

Findings

The Los Angeles wireless 9-1-1 Trial provided an opportunity to explore the real world implications of wireless E9-1-1. It yielded important insights into the technical, operational, fiscal, legal and regulatory complexity surrounding wireless E9-1-1.

Technical

The E9-1-1 network in California is separate from the Public Switched Telephone Network (PSTN) that provides local and long-distance telephone services to the public. Every wireline 9-1-1 call made in California is routed from the PSTN, through the E9-1-1 dedicated network, to one of the more than 400 local PSAPs serving the state. Along with the voice call, call takers also receive the caller's

² The text of the Executive Order is included as Appendix B.

ten-digit telephone number (ANI) and the address and other pertinent information about the location where the call was placed (ALI).

From a technical perspective, the Los Angeles Wireless E9-1-1 Trial had two primary objectives:

- Selectively route wireless 9-1-1 calls through the existing wireline E9-1-1 network to the appropriate PSAP.
- Deliver call back number (ANI) and cell site location information (ALI) to the PSAP receiving the voice call.

The trial produced viable technical solutions that satisfied these objectives as well as other important technical findings summarized below:

- Wireless carriers have the capability to transmit call back number (ANI) and cell location information (ALI) into the existing E9-1-1 network.
- The existing E9-1-1 network has the capacity to deliver wireless 9-1-1 call ANI and cell location data to local PSAPs.
- Additional data and data management will be required to supply the ALI for wireless E9-1-1 calls.
- Some of the Customer Premise Equipment (CPE) used in the trial and installed in local PSAPs will require further customization to process the ANI and cell location data delivered by the E9-1-1 network.
- The existing E9-1-1 network has the capacity to deliver wireless 9-1-1 call ANI and cell location data to CHP PSAPs where trunks and CPE have been upgraded to transmit and receive the information.
- The CHP's 24 PSAPs do not currently have CPE needed to process E9-1-1 information.
- The CHP currently receives wireless 9-1-1 calls over the Public Switched Telephone Network (PSTN). Caller ID technology installed at many CHP locations provides some of the ANI functionality furnished by E9-1-1. In the 70 percent of cases where the caller has not blocked Caller ID, the call taker is able to view the caller's telephone number and can, therefore, call back in the event the original call is disconnected.
- Unlike the ANI, Caller ID cannot be automatically passed through the E9-1-1 network in cases where the call is transferred to another PSAP.

Operational

Phase I of the FCC Order is designed to steer wireless 9-1-1 calls to the PSAP having jurisdiction at the emergency location.

- Selective routing depends on algorithms that overlay the area covered by a cell's antennas with jurisdictional boundaries. Jurisdictional boundaries and cell footprints are not congruent. Therefore, routing algorithms based on cell location cannot always determine jurisdiction.

- Because the trial took place in an urban area crisscrossed by several freeways, cell location was not always sufficient to determine whether the emergency event occurred within the CHP's or a local PSAP's jurisdiction.

Fiscal

Estimated costs for statewide implementation of solutions developed in connection with the trial are very preliminary and useful only as a starting point in determining true costs. Cost estimates are based on:

- The number of wireless subscribers
- The number of wireless 9-1-1 calls per year
- Pricing information gathered from wireless carriers, local exchange carriers and 9-1-1 service providers
- Preliminary projected costs for statewide Phase I service vary significantly:
 - One time cost estimates range from \$6 to \$19 million
 - Annual recurring costs range from \$39 to \$51 million.
- One time costs may be incurred to upgrade the CHP's PBXs to allow display of ALI data.
- The particular solution chosen will affect one-time and recurring costs.
- Recurring costs will vary depending on whether providers price their services based on total number of wireless subscribers or total number of wireless 9-1-1 calls.

Legal and Regulatory

Wireless carriers operating within California do not currently have the same liability protection enjoyed by wireline carriers. Carrier concerns about liability have prevented selective routing of wireless 9-1-1 calls to PSAPs other than the CHP. Legislation recently passed by the United States Congress and signed by the President provides for parity in liability protection between wireline and wireless carriers.

Lessons Learned

In addition to the significant findings resulting from the Los Angeles Wireless 9-1-1 Trial, the state gained insight into the process of conducting a 9-1-1 trial. This knowledge will inform the methods used to conduct any future pilots undertaken by 9-1-1 stakeholders.

Outstanding Issues

The Los Angeles Wireless 9-1-1 Trial did not produce a clear-cut case to support statewide implementation of Phase I of the FCC's Order. The benefits of knowing a 9-1-1 caller's precise location and call back number are obvious. However, outstanding issues must be resolved prior to making any decision on a course of action for deployment of either Phase I or Phase II of the FCC's Order. The following are some of those issues:

- The Los Angeles Wireless 9-1-1 Trial took place in a densely populated urban area. Other topographies and demographics were not evaluated and, therefore, the state does not have a complete understanding of the potential benefits of Phase I across California.
- Estimated costs to implement Phase I are imprecise. Costs to implement Phase II are not known.
- Evaluating the costs and benefits related to future wireless E9-1-1 actions will require a cost model of sufficient detail to allow alternatives to be evaluated.
- The ability of current funding mechanisms to match costs associated with either Phase I or Phase II must be explored and new legislation and regulations may be required.
- The effect of wireless E9-1-1 on call taker workloads has not been studied and, therefore, associated impact on the CHP and local PSAPs is unknown.
- Legislation permitting wireless 9-1-1 calls to be routed to PSAPs other than those operated by the CHP must be passed.
- The relationship between the technology required to support Phase I and that required to support Phase II is not known at this time. A clearer understanding of the relationship between the two is desirable before deciding on a course of action.

Conclusion and Next Steps

Californians place a high priority on the effectiveness and efficiency of the 9-1-1 system. Demographics as well as the technical and regulatory forces shaping the telecommunications industry will continue to challenge the ability of the state's 9-1-1 system to deliver the quality of service the public demands. To successfully meet the challenge, the California 9-1-1 Program, administered by the DGS's Telecommunications Division is finalizing a strategic plan that approaches 9-1-1 services holistically but that also strongly emphasizes the needs of wireless 9-1-1.

The California 9-1-1 Program's Strategic Plan will guide the state's next steps. The 9-1-1 Program will lead the effort to develop comprehensive requirements for wireless E9-1-1. These requirements will consider the perspective of all 9-1-1 stakeholders and will address technical, operational, fiscal, legal and policy issues.

Specific actions under consideration include additional pilots in areas with different topographical and demographic characteristics as well as pilots to investigate Phase II of the FCC Order. Within this context, the Los Angeles Wireless 9-1-1 Trial constitutes an important initial step in achieving a 9-1-1 system that meets the state's needs going forward.

The California 9-1-1 Program has a long-standing commitment to promoting the highest level of 9-1-1 services to all callers, regardless of the calling technology. Ensuring wireless callers the advantages of enhanced 9-1-1 will continue to have the highest priority.

Trial Overview

Los Angeles E9-1-1 Trial

In mid-1997, the CHP initiated a project to evaluate the technical feasibility and potential benefits of implementing the specific E9-1-1 functionality defined in Phase I of the FCC Order. That project grew to also include participants from the California 9-1-1 Program, six southern California PSAPs, four wireless carriers, and two suppliers of 9-1-1 services, as well as a number of consultants.

During the trial, which began in August, 1998, and concluded in January, 1999, wireless 9-1-1 calls made within the trial area were monitored, tracked, and, in some cases, selectively routed using the existing E9-1-1 network. Wireless carriers transmitted call back telephone number (ANI) and cell location information (ALI) to the wireline E9-1-1 network for delivery to participating CHP and local PSAPs.

The trial took place in the 63 square mile San Gabriel Valley area of Los Angeles County. The trial geography included the cities of Pasadena, South Pasadena, Temple City, Arcadia, San Marino, and Sierra Madre. The Foothill Freeway (Interstate 210) is the main east-west corridor within the trial area. State Route 110 (historic route 66) and State Route 19 (Rosemead Boulevard) are also major thoroughfares within the trial area. The trial area was chosen because it is similar to major metropolitan areas of California, including Los Angeles, where most wireless 9-1-1 calls originate. Appendix D contains maps of the trial area.

Public Sector Participants

Arcadia Fire Department - Arcadia Communications, which is part of Arcadia Fire Department, provided personnel and support services to answer wireless 9-1-1 calls selectively routed or transferred to them from the trial area. Arcadia answered enhanced wireless 9-1-1 calls on five previously owned P.E.I. MAARS View workstations.

CHP Information Management Division (CHP/IMD) - CHP/IMD provided project management and a single point of contact for CHP activities related to the trial.

CHP Los Angeles Communications Center (CHP/LACC) - CHP/LACC, the sole CHP communications center in Los Angeles County, provided support services and call taker personnel to handle 9-1-1 calls from the trial area. CHP/LACC received the overwhelming majority of wireless calls in the trial area using two TCI E-911 workstations and two E9-1-1 trunks that were installed specifically for the trial.

Los Angeles County Sheriff/Temple City Substation - Temple City Sheriff provided personnel and support services for wireless 9-1-1 calls selectively routed

or transferred to them from the trial area. Temple City answered enhanced wireless 9-1-1 calls on their seven existing P.E.I. "Vesta" work stations.

Pasadena Police Department - Pasadena PD provided personnel and support services for wireless 9-1-1 calls selectively routed or transferred to them from the trial area. Pasadena PD answered enhanced wireless 9-1-1 calls using their nine existing P.E.I. Vesta workstations.

San Marino Police Department - San Marino is a small PSAP that provided personnel and support services to handle wireless 9-1-1 calls selectively routed or transferred to them from the trial area. San Marino answered enhanced wireless 9-1-1 calls on their two existing P.E.I. Electrokey E9-1-1 telephone sets.

Sierra Madre Police Department - Sierra Madre is a small PSAP that provided personnel and support services to handle wireless 9-1-1 calls selectively routed or transferred to them from the trial area. Sierra Madre is the only trial PSAP located in a GTE service area and served by a GTE ALI database. Wireless ANI/ALI was transferred from Pacific Bell's database to GTE's ALI database. Sierra Madre answered enhanced wireless 9-1-1 calls on their three existing P.E.I. MAARS View workstations.

State of California, Department of General Services, Telecommunications Division (the DGS-TD) - The DGS-TD Emergency Telephone Services Section (California 9-1-1 Program Office) provided funding for the trial and some project management. The California 9-1-1 Program oversees approximately 500 Public Safety Answer Points (PSAPs) statewide.

Public Sector Participants

Los Angeles Cellular Telephone Company (LACTC), now AT&T Wireless Services (AWS) - 9-1-1 calls received by this carrier from the trial area were selectively routed via the E9-1-1 network to CHP.

AirTouch Cellular (ATC) - 9-1-1 calls received by this carrier from the trial area were selectively routed via the E9-1-1 network to CHP.

GBH Telcom - GBH Telcom collected wireless 9-1-1 call statistics and provided weekly reports to participants in the trial.

GTE - GTE is the incumbent local exchange carrier (ILEC) providing landline E9-1-1 service and equipment for the Sierra Madre PSAP. GTE maintains its own E9-1-1 database for landline service. GTE's involvement in the Los Angeles Trial was intended to demonstrate the feasibility of passing wireless E9-1-1 information (ANI & ALI) between GTE and Pacific Bell networks in a wireless E9-1-1 environment.

Nextel Communications - Nextel is one of the major wireless carriers operating in the trial geography. Nextel was included in the initial trial planning meetings but was unable to participate because of incompatibilities in their switching centers. Nextel planned to be capable of providing E9-1-1 services in 1999.

Pacific Bell - Pacific Bell is the incumbent local exchange carrier (ILEC) providing landline E9-1-1 service and equipment for five of the six participating PSAPs in the trial area. Pacific Bell owns the selective router switch (in San Gabriel) and numerous communications links used to deliver calls and information to participating PSAPs. Pacific Bell provided E9-1-1 network-related project management services to the State of California and upgraded customer premise equipment (CPE) at participating PSAPs at no cost to the state.

Pacific Bell Wireless (PBW) - PBW was one of two PCS carriers serving the trial area. 9-1-1 calls received by this carrier from the trial area were selectively routed via the E9-1-1 network either one of the six participating local PSAPs or to the CHP.

RCC Consultants, Inc. - RCC is a telecommunications consulting firm that contracted with the state to provide consulting services for the project.

SCC - SCC is an E9-1-1 database services provider that supplied Phase I ALI database during the trial.

Sprint PCS - Sprint PCS is one of two PCS carriers in the trial area. 9-1-1 calls received by this carrier from the trial area were selectively routed via the E9-1-1 network either one of the six participating local PSAPs or to the CHP.

XYPOINT - XYPOINT is an E9-1-1 database services provider that supplied Phase I ALI database during the trial.

Technical Solutions Overview

Overview of E9-1-1 Call Delivery

All of the solutions demonstrated in Los Angeles Wireless E9-1-1 Trial leveraged the existing wireline E9-1-1 network. Figure 1 below presents a conceptual overview of the relationship between wireline and wireless E9-1-1 demonstrated in the trial.

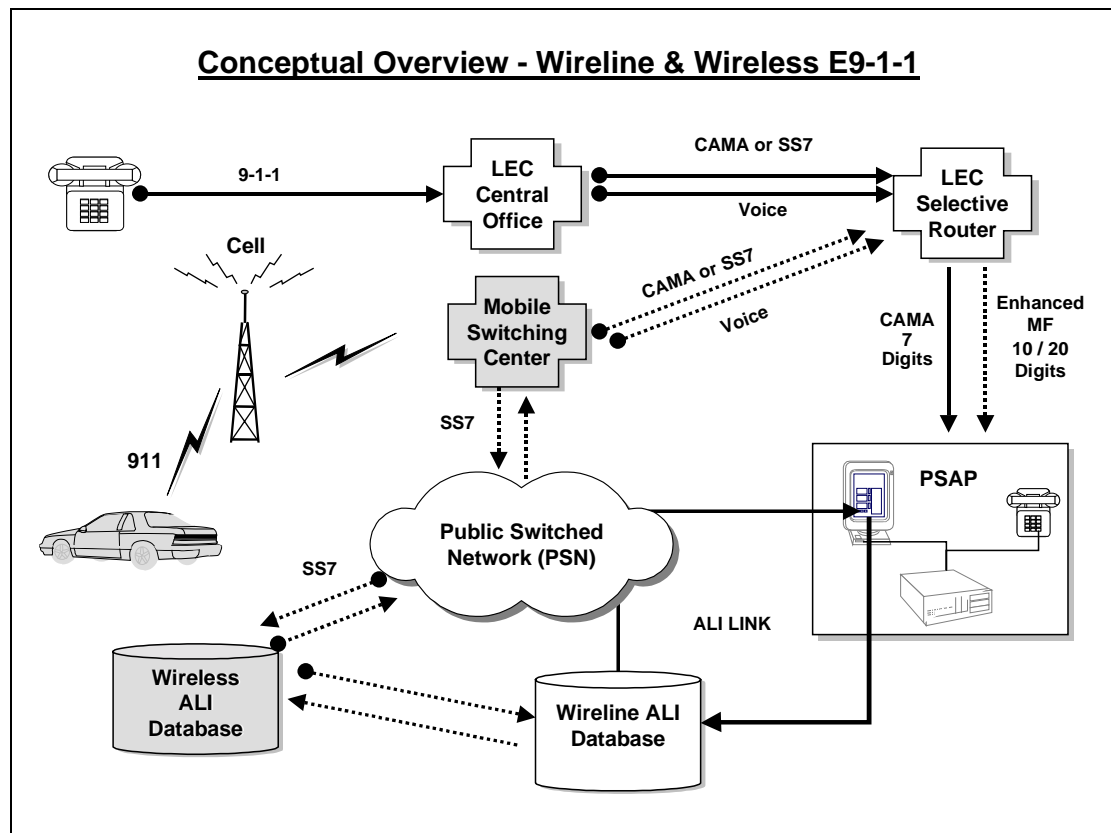


Figure 1

Components of E9-1-1 Service Delivery

Enhanced 9-1-1 services consists of two major components:

1. **The network component**, which transmits voice and data, includes the following:
 - a. LEC Central Office, which receives wireline calls, or the Mobile Switching Center (MSC), which receives wireless calls
 - b. LEC Selective Router, which routes the call to the appropriate PSAP

- c. Controller at the PSAP, which receives voice and data, directs the call within the PSAP and coordinates retrieval of caller location data (ALI) from the data element
 - d. Telecommunications connections, which transmit voice and data.
- 2. **The data component**, which supplies caller location information (ALI), consists of the following:
 - a. Wireline ALI database, which contains:
 - i) Cross reference between wireline telephone numbers and associated location information including the address where the wireline telephone is located (wireline ALI)
 - ii) Cross reference between the wireless E9-1-1 call and the Wireless ALI Database
 - b. Wireless ALI database, which contains:
 - i) Cross-reference between the wireless E9-1-1 call, the cell where the wireless call was received and associated cell site location information such as the related Thomas Brothers' Map Page.

The Los Angeles Wireless E9-1-1 Trial required the following augmentation to the existing E9-1-1 network:

- New connection between the wireless exchange carriers' Mobile Switching Centers and Pacific Bell's LEC Selective Router
- New connections between the Pacific Bell's Wireline ALI Database and the Wireless ALI Databases provided by SCC and XYPOINT
- New Enhanced Multi-Frequency trunks between the LEC Selective Router and participating PSAPs that were required because exiting trunk protocols limited transmission to seven digits and did not permit delivery of the ten-digit call back telephone number over this link.

Wireless components are shaded in Figure 1 above. Solid lines represent existing network connections; dotted lines represent new network connections. Network connections labeled "CAMA (Centralized Automatic Message Accounting) or SS7 represent, respectively, the analog or digital circuit used to transmit data associated with the voice call.

E9-1-1 Call Processing

The following flow of a call through the network pictured in Figure 1 illustrates the high-level E9-1-1 process for wireless 9-1-1 calls:

1. A wireless 9-1-1 call enters the existing wireless network via a cell, which receives and transmits wireless calls placed within the surrounding area.

2. The cell transmits the voice call along with associated cell identifier information to an existing Mobile Switching Center (MSC).
3. In some cases, the MSC transmits data about the call to the Wireless ALI Database and, in turn, receives a key uniquely identifying the call.
4. The MSC transmits the voice call and associated data (either the unique key associated with the call or caller's telephone number and the identifier of the cell that received the call) to the selective router.
5. The Selective Router contains tables that correlate the data transmitted by the MSC with an Emergency Services Number (ESN) which represents a specific PSAP. Based on the correlation, the Selective Router transmits the voice call and associated data to the controller at the appropriate PSAP.
6. Using data transmitted with the wireless 9-1-1 call by the MSC as the database key, the PSAP controller sends a request for related location information to the Wireline ALI Database.
7. The Wireline Database returns location information to the Wireline ALI Database, which in turn, passes the information to the PSAP controller and then to the call taker.

Los Angeles Wireless E9-1-1 Trial Technical Solutions Summary

Several technical solutions were implemented to support the wireless trial. All solutions were successful in providing enhanced 9-1-1 functionality and demonstrating compliance with Phase I of the FCC Order. However, differences in implementation are important because they potentially translate into differences in performance or cost. Table 1 below summarizes some important aspects of each vendor's trial solution.

Los Angeles Wireless E9-1-1 Trial Solutions Summary			
Wireless Solution Provider	Cellular / PCS	Selective Routing	CAS / NCAS
Air Touch Cellular / XYPOINT	Cellular	CHP only	NCAS
LA Cellular Wireless / SCC	Cellular	CHP only	NCAS
PacBell Wireless / Pacific Bell	PCS	Any PSAP	CAS
Sprint PCS / Pacific Bell	PCS	Any PSAP	CAS

Table 1

High Level Comparison of Solutions

The following discussion below compares three characteristics of the solutions provided in the trial:

- Cellular and PCS
- Selective Routing
- CAS and NCAS

Cellular / PCS

Wireless telephones addressed by the FCC Order use commercial mobile radio services to transmit voice and data over wireless networks. Two types of wireless telephones are generally available today: cellular telephones and Personal Communications Services (PCS) telephones. Cellular and PCS telephones operate in different bands of the electromagnetic spectrum and may have different functionality.

None of the difference between cellular and PCS technology affects the ability of their users to place 9-1-1 calls. However, the distinction between cellular and PCS played a major role in the conduct of the Los Angeles Wireless 9-1-1 Trial. (Throughout this report, the terms “cellular” and “PCS” are used whenever the distinction between the two technologies is relevant to the discussion; the term “wireless” is used when the context requires no differentiation between the two).

When they were first introduced, most cellular telephones were permanently mounted in automobiles and most wireless 9-1-1 calls were placed by motorists. Because California law, enacted before wireless telephones became ubiquitous, directs all cellular 9-1-1 calls to be routed to the CHP, the cellular carriers

participating in the trial required their subscribers' calls to be selectively route to the CHP.

Approximately 80 percent of 9-1-1 calls placed during the trial period were placed using cellular telephones and 20 percent were placed using PCS telephones.

Selective Routing

All 9-1-1 calls placed during the trial period were routed through the Selective Router. The Selective Router directed cellular calls to the CHP. Depending on the receiving cell site, the selective router directed PCS calls either to the CHP or one of the participating local PSAPs.

CAS / NCAS

The fundamental difference between basic and enhanced 9-1-1 is that enhanced 9-1-1 provides the call taker with useful data such as the caller's location (ALI) and telephone number (ANI) along with voice communication with the person seeking assistance. Delivery of the ANI over the same path used to transmit voice is termed "Call Path Associated Signaling (CAS). Similarly, delivery of data over a separate path is termed Non-Call Path Associated Signaling (NCAS).

From the call taker's perspective, the data path is unimportant. However, there are considerations, which are discussed, in the following paragraphs, associated with each solution.

The FCC Order requires that a ten-digit call back number be transmitted to the call taker. Currently, the CAMA links between the selective routers and the PSAPs support transmission of seven-digit call back telephone numbers. As in the Los Angeles Wireless E9-1-1 Trial, the CAS solution requires upgrades to the links between selective routers and PSAPs to permit transmission of ten-digit call back telephone numbers. The NCAS solution avoids the limitation of the existing CAMA links by transmitting the call back telephone number over the ALI link (illustrated in Figure 1 above), which is able to accommodate ten or more digits.

The CAS solution assures that the call taker will always receive the caller's telephone number (ANI) because the telephone number is routed with the voice call. The NCAS solutions, as implemented in the trial, transmit the ANI to the call taker over the ALI link. Any failure in the ALI link will preclude the call taker from automatically receiving the call back number (ANI).

Los Angeles Wireless E9-1-1 Trial Call Solution Detail

Figure 2 below is a more detailed illustration of the network and data architectures employed by the participants in the trial.

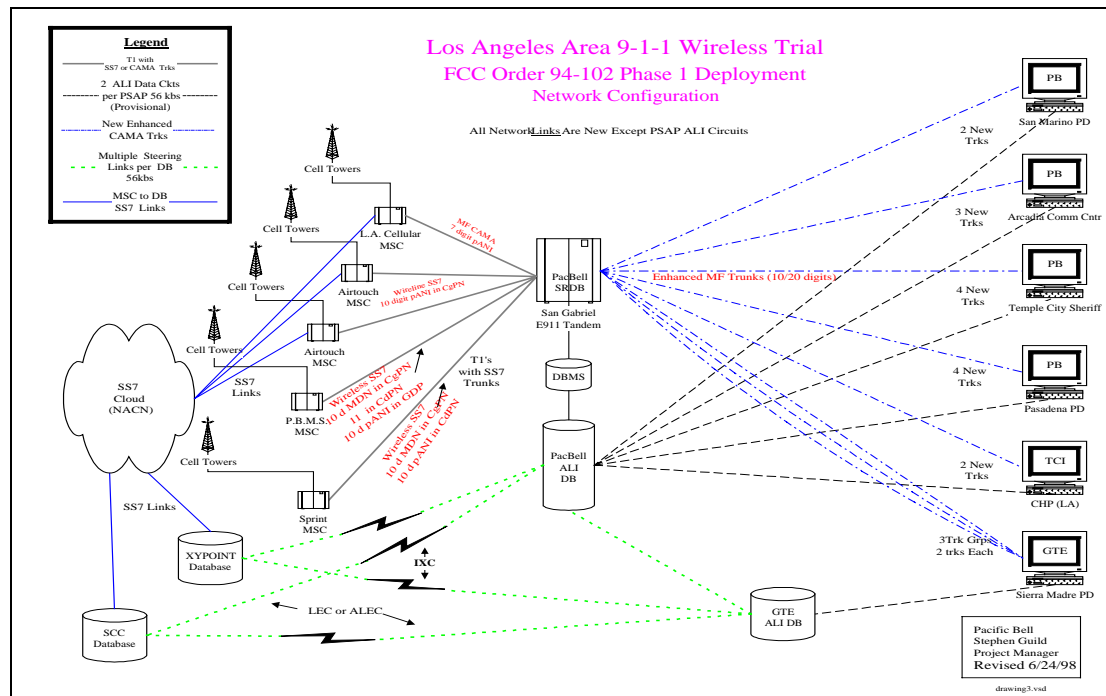


Figure 2

Vendors participating in the trial demonstrated four solutions that satisfy the FCC Order. Each solution required the partnership between a wireless carrier serving the trial geography and a database services provider that associated a wireless 9-1-1 call with the location of the cell site that received the call.

The four solutions were provided by the following partnerships:

- Air Touch Cellular and XYPOINT
- LA Cellular Wireless (now AT&T Wireless) and SCC
- Pacific Bell Wireless and Pacific Bell
- Sprint PCS and Pacific Bell

The solutions that the participating vendors might propose today are not discussed here. The solutions demonstrated by each of the vendors participating in the trial are described in the following paragraphs.

Air Touch Cellular and XYPOINT Solution

Air Touch Cellular and XYPOINT demonstrated a Non-Call-Path Associated Signaling (NCAS) solution. NCAS solutions deliver data (ANI and ALI) over a path different from the voice call. 9-1-1 calls received by Air Touch Cellular during the trial followed the path outlined below:

- Over an SS7 digital link, Air Touch Cellular Mobile MSC routed the caller's ten-digit telephone number, receiving cell sector and MSC identifiers to XYPOINT.

- XYPOINT returned up to 20 digits, which included a ten-digit non-dialable Emergency Services Routing Key (ESRK) to Air Touch Cellular.
- Air Touch Cellular routed the call and, in the Calling Party Number field of an SS7 link, the ESRK, to the Pacific Bell selective router.
- The selective router correlated the ESRK to the CHP PSAP Emergency Services Number (ESN).
- The selective router routed the Air Touch Cellular call and ESRK to the CHP PSAP's 9-1-1 controller over an enhanced Multi-frequency trunk capable of carrying either ten or twenty digits.
- Using the ESRK as the key, the CHP PSAP controller requested ALI information. The request was transmitted via the Pacific Bell ALI database to the XYPOINT database, which returned the caller's ten-digit telephone number (ANI) as well as a description of the receiving cell sector location (ALI).

LA Cellular Wireless (now AT&T Wireless) and SCC Solution

LA Cellular and SCC also demonstrated a Non-Call-Path Associated Signaling (NCAS) solution. 9-1-1 calls received by LA Cellular during the trial followed a path similar to that described in the Air Touch Cellular / XYPOINT solution. However, the connection between the LA Cellular MSC and the Pacific Bell selective router used an analog protocol called (Centralized Automatic Message Accounting (CAMA) which transmitted the ESRK along with the voice call. All LA Cellular Wireless Calls were routed by the selective router to the CHP PSAP.

Pacific Bell Wireless and Pacific Bell Solution and

Sprint PCS and Pacific Bell Solution

PCS participants, Pacific Bell Wireless and Sprint PCS, demonstrated Call Path Associated Signaling (CAS) solutions in which the associated data (ANI and ALI) are transmitted over the same circuit as the voice call.

9-1-1 calls received by the PCS carriers during the trial followed the path outlined below:

- The MSC transmits the ten-digit ANI and a ten-digit Pseudo ANI (P-ANI), which is the unique non-dialable number associated with the cell sector, to the Pacific Bell selective router.
- Based on the P-ANI, the selective router determines the appropriate PSAP and delivers the ANI, P-ANI and call to the PSAP controller.
- The PSAP controller displays the ANI to the call taker.
- Based on the P-ANI delivered with the voice call, the database service determines the location of the cell receiving the call and the cell site and other location information to the call taker.

Projected Costs

Estimated Costs for statewide implementation of FCC Order Phase I

The projected costs presented here are very preliminary. They are based on assumptions about the number of wireless subscribers and wireless 9-1-1 calls placed annually in California as well as on estimated charges obtained from local exchange carriers, wireless carriers and 9-1-1 service providers. Using the resulting simple pricing model, the state's projected costs for statewide Phase I service vary over a significant range:

- One time cost estimates range from \$6 to \$19 million
- Annual recurring costs range from \$39 to \$51 million.

Cost Breakdown

To better understand these cost projections, the DGS's Telecommunications Division segregated costs into the following four categories:

- Wireless Carrier Costs
- Local Exchange Carrier (LEC) costs
- PSAP Costs
- Miscellaneous costs

Table 2 below summarizes projected one time and annually recurring costs within the four categories.

**Table of One Time and Recurring Costs
Statewide Implementation of FCC Order Phase I**

Cost Category	One Time Costs		Annual Recurring Costs	
	Estimated Cost in Millions of \$\$\$	Description	Estimated Cost in Millions of \$\$\$	Description
Wireless Carrier			\$30-\$40	<ol style="list-style-type: none"> 1. Mobil Switching Center (MSC) software 2. Network trunks to link MSC to E9-1-1 network 3. Project management and data administration
Local Exchange Carrier	\$3	<ol style="list-style-type: none"> 1. Trunks to connect CHP to E9-1-1 network 2. Additional trunks for local PSAPs 	\$9-\$11	<ol style="list-style-type: none"> 1. Additional trunks at CHP and local PSAPs 2. Call delivery charges 3. Data administration
PSAP Equipment Upgrade	\$2-\$15	<ol style="list-style-type: none"> 1. CHP PBX upgrades to allow display of ALI 2. Possible local PSAP equipment upgrades 		
Miscellaneous	\$1	<ol style="list-style-type: none"> 1. State and local personnel costs for Phase I implementation 		Unknown
Total	\$6-\$19 Million		\$39 - \$51 Million	

Table 2

Factors Contributing to Cost

Among the factors influencing the actual costs incurred by the state will be the solution selected, the extent to which it is deployed and the actual pricing algorithms used by the 9-1-1 suppliers of location data (ALI).

Los Angeles Trial Measured Data

Data presented in this report was collected during the period beginning August 24, 1998, and ending January 3, 1999. The data represents the majority of wireless 9-1-1 calls made within the trial geography. Various call-related measurements were conducted throughout the trial period by GBH Telecommunications Consulting and the data gathered was sent to the state in weekly reports. Additionally, some of the trial partners, XYPOINT, SCC and Pacific Bell, provided data reports.

Some of the data gathered is presented in the following tables contained in Appendix C.

Table 3 - Wireless Call Delivery Data

Table 4 - Wireless Call Delivery Data

Table 5 - Wireless Call Delivery Data

Table 6 - Selective Routing Data

Table 7 - Combined Cellular and PCS Would Be” Selective Routing

Table 8 - Arcadia PSAP Transferred Calls

Table 9 - Pasadena PSAP Transferred Calls

Table 10 - San Marino PSAP Transferred Calls

Table 11 - Sierra Madre PSAP Transferred Calls

Table 12 - Temple City PSAP Transferred Calls

Table 13 - Los Angeles CHP PSAP Transferred Calls

Table 14 - Los Angeles CHP Transfer Rates

Conclusion

Today, a community of state and local government agencies dedicated to saving lives and protecting property provide 9-1-1 services throughout California. Rapid advances in technology, increasing population and explosive growth in wireless telephone usage challenge the ability of this community to deliver the highest quality 9-1-1 service available. Meeting the challenge will require strategic planning that considers emerging technologies, mandates, funding mechanisms, and the continuing impact of deregulation of the telecommunications industry. The Los Angeles Wireless E9-1-1 Trial represents an important step in the state's ongoing dedication to the excellence of its 9-1-1 system.

Appendix A

This appendix contains excerpts from two documents related to the Federal Communications Commission Docket No. 94-102:

1. The executive summary from the Report and Order and Further Notice of Proposed Rulemaking release by the FCC July 26, 1996 (p. A.2)
2. Third Report and Order released by the FCC October 6, 1999 (p. A.6)

In the Matter of)
)
Revision of the Commission's Rules) CC Docket No. 94-102
To Ensure Compatibility with) RM-8143
Enhanced 911 Emergency Calling Systems)

REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING

Adopted: June 12, 1996

Released: July 26, 1996

B. Executive Summary of Commission Actions

1. Report and Order

1. In this proceeding, we adopt several requirements pursuant to our authority under Sections 301 and 303(r) of the Communications Act, and make them applicable to all cellular licensees, broadband PCS licensees, and certain Specialized Mobile Radio (SMR) licensees (as defined in Section IV.B.2, *infra*). These classes of licensees are hereafter referred to as "covered carriers." Certain other SMR licensees and Mobile Satellite Service (MSS) carriers are exempt from our requirements. The requirements we adopt in this Report and Order are as follows:

- Not later than 12 months after the effective date of the rules adopted in this proceeding, covered carriers must process and transmit to any appropriate PSAPs all 911 calls made from wireless mobile handsets which transmit a code identification,³ including calls initiated by roamers. The processing and transmission of such calls shall not be subject to any user validation or similar procedure that otherwise may be invoked by the covered carrier.

³ The term "code identification," when used in this Order in conjunction with 911 calls, means (1) in the case of calls transmitted over the facilities of a covered carrier other than a Specialized Mobile Radio carrier that is subject to the requirements of this Order, a call originated from a mobile unit which has a Mobile Identification Number (MIN); and (2) in the case of calls transmitted over the facilities of a Specialized Mobile Radio carrier that is subject to the requirements of this Order, a call originated from a mobile unit which has the functional equivalent of a MIN. A MIN is a 34-bit binary number that a PCS or cellular handset transmits as part of the process of identifying itself to wireless networks. Each handset has one MIN, and it is derived from the ten-digit North American Numbering Plan (NANP) telephone number that generally is programmed into the handset at the time service for a new subscriber is initiated. See, e.g., EIA/TIA Standard 553, Mobile Station - Land Station Compatibility Specification, September 1989, at 2.3.1.

- In the case of 911 calls made from wireless mobile handsets that do not transmit a code identification, not later than 12 months after the effective date of the rules adopted in this proceeding, covered carriers must process and transmit such calls to any appropriate PSAP which previously has issued a formal instruction to the carrier involved that the PSAP desires to receive such calls from the carrier.
- Not later than 12 months after the effective date of the rules adopted in this proceeding, covered carriers must be capable of transmitting calls by individuals with speech or hearing disabilities through devices used in conjunction with or as a substitute for traditional wireless mobile handsets, e.g., through the use of Text Telephone Devices (TTY) to local 911 services.
- The implementation and deployment of enhanced 911 features and functions will be accomplished in two phases. Under Phase I, not later than 12 months after the effective date of the rules adopted in this proceeding, covered carriers must have initiated the actions necessary to enable them to relay a caller's Automatic Number Identification (ANI) and the location of the base station or cell site receiving a 911 call to the designated PSAP. Not later than 18 months after the effective date of the rules adopted in this Order, such carriers must have completed these actions. These capabilities will allow the PSAP attendant to call back if the 911 call is disconnected.
- Under Phase II, not later than five years after the effective date of the rules adopted in this proceeding, covered carriers are required to achieve the capability to identify the latitude and longitude of a mobile unit making a 911 call, within a radius of no more than 125 meters in 67 percent of all cases.

2. We also provide that the E911 (Phase I and Phase II) requirements imposed upon covered carriers by our actions in this Order shall apply only if (1) a carrier receives a request for such E911 services from the administrator of a PSAP that is capable of receiving and utilizing the data elements associated with the services; and (2) a mechanism for the recovery of costs relating to the provision of such services is in place. If the carrier receives a request less than 6 months before the implementation dates of Phase I and Phase II, then it must comply with the Phase I and Phase II requirements within 6 months after the receipt of the notice specifying the request.

3. Covered carriers, in coordination with the public safety organizations, are directed to resolve certain E911 implementation issues, including grade of service and interface standards, through industry consensus in conjunction with standard-setting bodies. This Commission intends to remain actively involved, as appropriate, to ensure resolution of issues necessary to prompt widespread availability of E911 service.

2. Further Notice of Proposed Rulemaking

4. The E911 system requirements we are establishing in this Order are a first step toward our goal of improving the availability and quality of 911 service. In view of the Nation's important public safety needs, we find a compelling public interest in

taking steps to ensure that E911 system performance keeps pace with the latest technologies. Therefore, we are also issuing a Further Notice of Proposed Rulemaking to develop additional means of ensuring that improvements made possible by technological advances are incorporated into E911 systems.

5. In the Further Notice of Proposed Rulemaking, we tentatively conclude and request comment as follows:

- We seek comment on possible approaches to avoid customer confusion that could be generated by a system under which customers in the same geographic area may or may not be able to complete non-code identification⁴ 911 calls depending upon the practices of the various PSAPs serving that area. Specifically, we request comment regarding whether, within a reasonable time after the one-year period, PSAPs should no longer have the option to refuse to accept non-code identification 911 calls. Thus, covered carriers would be obligated to transmit all 911 calls to PSAPs.
- We tentatively conclude that covered carriers should continue to upgrade and improve 911 service to increase its accuracy, availability, and reliability, while also recognizing that our rules should ensure that covered carriers' development and application of new technologies for E911 services also contribute to the overall quality of service and range of services that carriers provide to all their customers. These efforts will ensure that the public benefits from technological innovations, through the application of those innovations to public safety needs.
- We seek comment on a range of related issues, including the following: (1) Should covered carriers provide PSAPs information that locates a wireless 911 caller within a radius of 40 feet, using longitude, latitude, and altitude data, and that provides this degree of accuracy for 90 percent of the 911 calls processed? (2) Should wireless service providers be required to supply location information to the PSAP regarding a 911 caller within a certain number of seconds after the 911 call is made? (3) Should wireless service providers be required to update this location information throughout the duration of the call? (4) What steps could be taken to enable 911 calls to be completed or serviced by mobile radio systems regardless of the availability (in the geographic area in which a mobile user seeks to place a 911 call) of the system or technology utilized by the user's wireless service?
- We also tentatively conclude that a consumer education program should be initiated to inform the public of the capabilities and limitations of 911 service, and we seek comment regarding the scope of such a program and carrier obligations that could be established in connection with such a program. One purpose of such a program would be to address a concern that consumers currently may not have a sufficient understanding of technological limitations

⁴ The term "non-code identification," when used in this Order in conjunction with 911 calls, means a call originated from a mobile unit which does not have a code identification.

that can impede transmission of wireless 911 calls and the delivery of emergency assistance.

Revision of the Commission's Rules)	CC Docket No. 94-102
To Ensure Compatibility with)	RM-8143
Enhanced 911 Emergency Calling Systems)	

THIRD REPORT AND ORDER

Adopted: September 15, 1999

Released: October 6, 1999

II. EXECUTIVE SUMMARY

6. Specifically, we adopt the following revisions to our wireless E911 rules:

- Wireless carriers who employ a Phase II location technology that requires new, modified or upgraded handsets (such as Global Positioning Systems (GPS)-based technologies) may phase-in deployment of Phase II subject to the following requirements:
 - Without respect to any PSAP request for Phase II deployment, the carrier shall:
 - 1. Begin selling and activating ALI-capable handsets no later than March 1, 2001;
 - 2. Ensure that at least 50 percent of all new handsets activated are ALI-capable no later than October 1, 2001; and
 - 3. In addition to the 50 percent requirement, ensure that at least 95 percent of all new digital handsets activated are ALI-capable no later than October 1, 2002.
 - Once a PSAP request is received, the carrier shall, in the area served by the PSAP:
 - 1. Within six months or by October 1, 2001, whichever is later:
 - a. Ensure that 100 percent of all new handsets activated are ALI-capable;
 - b. Implement any network upgrades or other steps necessary to locate handsets; and
 - c. Begin delivering to the PSAP location information that satisfies Phase II requirements.
 - 2. Within two years or by December 31, 2004, whichever is later, undertake reasonable efforts to achieve 100 percent penetration of ALI-capable handsets in its total subscriber base.
 - For roamers and other callers without ALI-capable handsets, carriers shall, at a minimum, support Phase I ALI and shall implement other available best practice methods of providing the location of the handset to the PSAP.
 - To be allowable under our rules, an ALI technology that requires new, modified, or upgraded handsets shall conform to general standards and be interoperable, allowing roaming among different carriers employing handset-based location technologies.

- For carriers employing network-based location technologies, we replace our current plan, which requires that implementation be fully accomplished within 6 months of a PSAP request, with a revised rule requiring the carrier to deploy Phase II to 50 percent of callers within 6 months of a PSAP request and to 100 percent of callers within 18 months of such a request.
- We adopt the following revised standards for Phase II location accuracy and reliability:
 - For network-based solutions: 100 meters for 67 percent of calls, 300 meters for 95 percent of calls;
 - For handset-based solutions: 50 meters for 67 percent of calls, 150 meters for 95 percent of calls.
- We direct wireless carriers to report their plans for implementing E911 Phase II, including the technology they plan to use to provide caller location, by October 1, 2000. This report shall provide information to permit planning for Phase II implementation by public safety organizations, equipment manufacturers, local exchange carriers, and this Commission, in order to support Phase II deployment by October 1, 2001.

Appendix B

Executive Order W-186-98

EXECUTIVE DEPARTMENT STATE OF CALIFORNIA



FILED
In the office of the Secretary of State
of the State of California

DEC 21 1998

ALL JONES, Secretary of State
By: *[Signature]*
Deputy Secretary of State

EXECUTIVE ORDER W-186-98

WHEREAS, The Phenomenal growth and use of wireless technology reflects the increasing reliance that millions of Californians and Americans place on the ability to communicate easily, affordably and in a mobile environment; and

WHEREAS, California is the nation's largest market for wireless service and is served by some of the most prestigious wireless companies in the industry, including, but by no means limited to, AT&T Wireless, AirTouch Communications, LA Cellular, Pacific Bell Mobile Services, GTE Wireless, Sprint PCS, and Cellular One; and

WHEREAS, Industry research estimates that a majority of all wireless customers purchase their phones for personal safety and security reasons, including the ability to access 911 in an emergency; and

WHEREAS, The explosion in the availability of wireless phones has benefited both individuals and the California economy, but also has had an unprecedented impact on those who receive emergency response services by dialing 911; and

WHEREAS, It is now estimated that more than 85,000 calls are made each day across the nation from wireless phones to Public Safety Answering Points (PSAPs), or 911 centers, with tens of thousands placed in California alone; and

WHEREAS, In July 1996, the Federal Communications Commission (FCC) issued Report & Order 94-102, and subsequently Memorandum Opinion and Order 97-402, encouraging wireless carriers to provide the public safety community with enhanced data (the 10-digit call back number and location information) to allow emergency response officials to more readily and effectively provide services to wireless callers in need of assistance; and

WHEREAS, The State of California has met the three conditions set forth by the FCC after which various provisions of Report & Order 94-102 become applicable: (1) the PSAP must request the services specified in paragraphs (d) and (e) of that Order: (2) the PSAP is capable of receiving and utilizing the data elements associated with the service; and (3) a mechanism for recovering the costs of the service is in place; and

WHEREAS, In July 1996, Governor Wilson established the Wireless 911 Task Force, joining together dedicated professionals from the public and private sectors who made recommendations to help ensure a viable public safety emergency response system for wireless telephone system users; and

PAGE TWO

WHEREAS, The Wireless 911 Task Force concluded in its Report to Governor Wilson that "Today, the 911 system experiences significant delays in answering calls, jeopardizing lives, health, and property. Without intervention, these delays threaten to functionally collapse the system as new phone devices and greater use increases demand on an already overburdened system. Californians place a high priority on a responsive 911 system. Appropriate measures (are needed) to ensure a viable 911 system to maximize public safety"; and

WHEREAS, The Department of General Services and the California Highway Patrol, in partnership with the wireless industry, are currently conducting a trial of wireless Emergency 911 (E911) service in the Los Angeles area to prepare for statewide implementation of the FCC-mandated service; and

WHEREAS, the Department of General Services and the California Highway Patrol, in partnership with the private sector, should take steps to expeditiously provide this new, lifesaving technology to all wireless subscribers so as to ensure the benefits of a high quality, reliable and sophisticated E911 system.

NOW, THEREFORE, I, PETE WILSON, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this order to become effective immediately:

1. The Department of General Services and the California Highway Patrol shall implement FCC Report & Order 94-102 and Memorandum Opinion and Order 97-402 to the fullest extent authorized by law and as rapidly as technologically possible in order to provide all citizens in California with the highest quality wireless E911 service available.
2. The Department of General Services shall promote technological improvements in the E911 system to maintain the most efficient and cost effective public safety service available, and shall regularly report to the Governor and the Legislature changes to existing laws and regulations which may arbitrarily or inadvertently frustrate public safety or prevent continued technological improvement of the system.
3. The Department of General Services shall encourage and support all viable technological means of distributing wireless E911 calls among and between the California Highway Patrol and local public safety agencies.
4. The Department of General Services shall consult with representatives of the wireless communications industry and other stakeholders for the purpose of examining the issue of the industry's potential legal liability for providing emergency telephone coverage through wireless networks, and the purpose of considering means of managing that liability.

IN WITNESS WHEREOF I have hereunto set my hand
and caused the Great Seal of the State of California to
be affixed this 21st day of December 1998.



Pete Wilson
Governor of California

ATTEST:

Bill Jones
Secretary of State

Appendix C

Table 3 - Wireless Call Delivery Data

Wireless 9-1-1 Call Attempts

Call attempts represent every instance of a caller within the trial geography making a wireless 9-1-1 call whether or not the call received a busy signal. Call attempt data was collected from Pacific Bell, for the first five weeks of the trial only. Call Attempt data is summarized in Table 3 below.

Call Attempts 8/24/98 - 9/27/98							
PSAP	8/24-8/30	8/31-9/6	9/7-9/13	9/14-9/20	9/21-9/27	Total	%
ARCADIA	19	14	30	26	21	110	2%
CHP	931	1,124	818	785	714	4,372	85%
PASADENA	110	111	77	92	74	464	9%
SAN MARINO	8	6	7	7	2	30	1%
SIERRA MADRE	19	24	1	5	0	49	1%
TEMPLE CITY	30	29	26	23	31	139	3%
ALL PSAPs	1,117	1,308	959	938	842	5,164	100%
OVERFLOWS							
CHP ONLY	52	163	45	35	32	327	

Table 3

The CHP had two E9-1-1 workstations to answer E9-1-1 calls from the trial area. When these positions were busy, calls overflowed to the call takers who did not have E9-1-1 capable equipment. A small percentage of calls at CHP received busy signals, most occurring as a result of freeway incidents.

Table 4 - Wireless Call Delivery Data

Wireless 9-1-1 Delivered Calls

“Delivered calls” are defined as wireless calls delivered to PSAPs without encountering a busy signal. Delivered calls include calls that were abandoned. Because calls transferred to another PSAP were counted both at the transferring and receiving PSAP, call volumes presented in Table 4 below are higher than call volumes presented in subsequent tables. Calls that overflowed from E-911 trunks to the 7-digit public lines at the CHP were not included in Table 4.

Each column contains the calls received by the PSAP in the column heading. Column headings also contain the associated ESN for the PSAP. Row labels identify the PSN of the PSAP that transmitted the call. Cells with the same row and column PSN contain calls that were selectively routed to the associated PSAP by the E9-1-1 network. For example, Arcadia (ESN 123) received a total of 362 calls; 84 of those were selectively routed by the E9-1-1 network to Arcadia. The remaining calls were received via transfer from another PSAP.

<i>Delivered Calls by PSAP & ESN</i> <i>All Participating PSAPs</i> <i>8/24/98 - 1/03/99</i>							
PSAP & ESN	Arcadia (123)	CHP (125)	Pasa. (120)	Si. Md. (122)	S. Mar. (124)	T. City (119)	Grand Total
119	6	10	5	0	3	278	302
120	0	78	366	1	4	1	450
121	0	32	141	0	3	0	176
122	2	0	1	8	1	1	13
123	84	10	0	0	0	0	94
124	2	2	0	0	35	1	40
125	254	11,572	776	5	48	177	12,832
497**	0	15	1	0	0	11	27
997**	0	2	0	0	0	0	2
UnA	0	1,810	0	0	0	0	1,810
(blank)	14	0	138	56	4	56	268
Percentage	2.3%	84.5%	8.9%	0.4%	0.6%	3.3%	100%
Grand Total	362	13,531	1,428	70	98	525	16,014

Table 4

Calls directed to South Pasadena, ESN 121, were routed to Pasadena, ESN 120.

The row labeled “UnA” represents 1810 calls (approximately 13.4 percent) delivered to the CHP without an ESN. The row labeled “blank” represents calls received at PSAPs other than the CHP that did not have an associated ESN.

Table 5 - Wireless Call Delivery Data

Primary Recipients of Wireless 9-1-1 Calls

Table 5 below shows only those calls directly routed by the selective router. This table does not include calls that were manually transferred from another PSAP. Because calls with an unknown ESN and test calls have been excluded, the totals do not precisely match totals presented in the previous table.

<i>Calls Delivered First by PSAP & ESN</i> <i>All Participating PSAPs</i> <i>8/24/98 - 1/03/99</i>							
PSAP & ESN	Arcadia (123)	CHP (125)	Pasa. (120)	Si. Md. (122)	S. Mar. (124)	T. City (119)	Grand Total
119						278	278
120			366				
121(S. Pas)			141				
120 +121							507
122				8			8
123	84						84
124					35		35
125		11,572					11,572
Percentage	0.7%	92.7%	4.1%	0.1%	0.3%	2.2%	100.00%
Grand Total	84	11,572	507	8	35	278	12,484

Table 5

The 11,572 calls delivered to the CHP represent approximately 93 percent of all wireless 9-1-1 calls: 100 percent of cellular calls and approximately 70 percent of PCS calls were delivered to the CHP first.

Table 6 - Selective Routing Data

Phase I Selective Routing

During the trial, wireless 9-1-1 calls placed using PCS technology were selectively routed based on the cell sector processing the call. Wireless 9-1-1 calls using cellular technology were routed to the CHP; however, the ESN (or PSAP) where the calls would have been selectively routed was captured and tabulated.

Table 6 below summarizes the distribution of cellular 9-1-1 calls received during the trial period if the E9-1-1 network had selectively routed these calls.

<i>Cellular Carriers "Would Be" Selective Routing Distribution All Participating PSAPs 8/24/98 - 1/03/99</i>		
SITE	Total Calls	Percentage Delivered to Each PSAP
Arcadia	511	4%
CHP	9,005	71%
Pasadena	2,136	17%
Sierra Madre	73	1%
San Marino	0	0%
Temple City	1,029	8%
Grand Total	12, 754	100%

Table 6

Table 7 - Selective Routing Data

During the trial, wireless 9-1-1 calls placed using PCS technology were selectively routed based on the cell sector processing the call. Wireless 9-1-1 calls using cellular technology were routed to the CHP; however, the ESN (or PSAP) where the calls would have been selectively routed was captured and tabulated.

Table 7 below shows the distribution of calls among participating PSAPs if both cellular and 9-1-1 PCS calls had been selectively routed based on cell location.

<i>Combined Cellular and PCS "Would Be" Selective Routing All Participating PSAPs 8/24/99/-1/03/99</i>		
SITE	Total Calls That Would Have Been Delivered to Each PSAP	Percentage That Would Have Been Delivered to Each PSAP
Arcadia	623	4%
CHP	11,261	70%
Pasadena	2,740	17%
Sierra Madre	125	1%
San Marino	9	0%
Temple City	1,337	8%
Grand Total	16,095	100%

Table 7

Table 8 through Table 13

Wireless 9-1-1 Call Transfer Data

Wireless 9-1-1 calls transferred by PSAPs in the trial area were tracked to identify the origination and destination points of the calls, including calls transferred between PSAPs. The data in the tables that follow present data related to calls received and transferred by each of the participating PSAPs. For example, Table 8 presents call transfer patterns for the Arcadia PSAP. Each column label represents the PSAP where the call was first routed. Each row label represents the PSAP where the call was transferred.

The shaded column shows the disposition of the 84 calls selectively routed to the Arcadia PSAP:

- 1 call transferred to El Monte
- 3 calls transferred to Monrovia
- 11 calls and 5 calls transferred to CHP locations

The column labeled “CHP (125)” shows the disposition of the 248 calls routed to the Arcadia PSAP by the CHP:

- 2 calls were rerouted to Monrovia
- 2 calls were rerouted to Sierra Madre
- 1 call was transferred back to the CHP
- 1 call was rerouted to Temple City

ARCADIA PSAP TRANSFERRED CALLS 8/24/98 - 1/03/99							
TRANSFERRED TO	ESN (PSAP)⇒	119 (TC)	122 (SI MAD)	123 (ARC)	124 (S.MAR)	125 (CHP)	UNKNOWN Grand Total
001 (EL MONTE)		0	0	1	0	0	1
002 (MONROV.)		0	0	3	0	2	5
004 (SI MADRE)		0	0	0	0	2	2
005 (CHP)		0	0	11	0	1	12
014 (TEM. CITY)		0	0	0	1	1	2
015 (CHP)		0	0	5	0	0	5
TOTAL XFERED		0	0	20	1	6	27
NOT XFERED		6	2	64	1	248	335
% XFERED				23.8%			
Grand Total		6	2	84	2	254	362

Table 8

PASADENA PSAP TRANSFERRED CALLS 8/24/98 - 1/03/99									
TRANSFERRED TO	ESN (PSAP)⇒	119 (TC)	120 (PAS)	121 (SPAS)	122 (SI MAD)	125 (CHP)	497 (TEST)	UNKNOW N	Grand Total
000 (?)		0	0	1	0	0	0	0	1
001(VERD FIRE)		1	29	5	0	22	0	4	61
002 (CHP)		0	58	41	0	4	0	6	109
003 (PPD)		0	1	0	0	1	0	1	3
006 (PD LIST)		0	4	23	0	11	0	3	41
TOTAL XFERED		1	92	70	0	38	0	14	215
NOT XFERED		4	274	71	1	738	1	124	1213
% XFERED			25.1%	49.6%					
Grand Total		5	366	141	1	776	1	138	1428

Table 9

For the trial Pasadena received all wireless 9-1-1 calls that originated in South Pasadena jurisdiction.

SAN MARINO PSAP TRANSFERRED CALLS 8/24/98 - 1/03/99									
TRANSFERRED TO	ESN (PSAP)⇒	119 (TC)	120 (PAS)	121 (SPAS)	122 (SI MAD)	124 (S.MAR)	125 (CHP)	UNKNOWN	Grand Total
001 (Pasa PD)		0	0	0	0	0	1	0	1
002 (S. Pas PD)		0	0	0	0	1	1	0	2
003 (San Gab)		0	0	0	0	0	2	0	2
005 (Alham PD)		0	0	0	0	0	1	0	1
006 (CHP)		0	0	0	0	2	0	0	2
007 (LAPD)		0	0	0	0	1	1	0	2
009 (S M PD)		0	0	0	0	0	1	0	1
013 (S Mar Fire)		0	1	0	0	3	1	0	5
TOTAL XFERED		0	1	0	0	7	8	0	16
NOT XFERED		3	3	3	1	28	40	4	82
% XFERED						20%			
Grand Total		3	4	3	1	35	48	4	98

Table 10

SIERRA MADRE PSAP TRANSFERRED CALLS 8/24/98 - 1/03/99						
TRANSFERRED TO	ESN (PSAP)⇒	120 (PASADENA)	122 (SI MADRE)	125 (CHP)	UNKNOWN	Grand Total
002 (?)		0	1	0	0	1
003 (?)		0	1	0	0	1
006 (?)		0	3	3	0	6
TOTAL XFERED		0	5	3	0	8
NOT XFERED		1	3	2	56	62
% XFERED			62.5%			
Grand Total		1	8	5	56	70

Table 11

TEMPLE CITY PSAP TRANSFERRED CALLS 8/24/98 - 1/03/99								
TRANSFERRED TO	ESN (PSAP)⇒	119 (TC)	120 (PAS)	122 (SI MAD)	124 (S.MAR)	125 (CHP)	497⁵ (TEST)	UNKNOWN Grand Total
001 (Fire)	18	0	0	0	0	1	0	19
002 (Lang. List)	2	0	0	0	0	0	0	2
003 (Other LASD)	33	0	0	1	5	0	0	39
006 (CHP)	11	0	0	0	2	0	0	13
TOTAL XFERED	64	0	0	1	8	0	0	73
NOT XFERED	214	1	1	0	169	11	56	452
% XFERED	23%							
Grand Total	278	1	1	1	177	11	56	525

Table 12

⁵ Test calls made to Temple City PSAP.

LOS ANGELES CHP PSAP TRANSFERRED CALLS 8/24/98 - 1/03/99										
TRANSFERRED TO										
ESN (PSAP)⇒	119 (TC)	120 (PAS)	121 (SPAS)	123 (ARC)	124 (S.MAR)	125 (CHP)	497⁶ (TEST)	997⁷ (TEST)	UNKNOWN	Grand Total
*20 (Nuisance)	0	0	0	0	0	6	0	0	4	10
*21 (LA City Fire)	0	0	0	0	0	32	0	0	6	38
*22 (LA Co. Fire)	1	0	0	0	0	84	0	0	7	92
*22 *21	0	0	0	0	0	3	0	0	0	3
*22 *22	0	0	0	0	0	1	0	0	0	1
*23 (LAPD - Main)	0	0	0	0	0	76	0	0	9	85
*23 *23	0	0	0	0	0	3	0	0	0	3
*24 (Temp City SO)	0	0	0	0	0	150	0	0	16	166
*24 *24	0	0	0	0	0	1	0	0	0	1
*24 *24 *24 *39	0	0	0	0	0	1	0	0	0	1
*26 (Cresc. SO)	0	0	0	0	0	15	0	0	4	19
*27 (ELA SO)	0	0	0	0	0	2	0	0	0	2
*30 (Pasa PD)	0	0	0	0	0	706	0	0	78	784
*30 *30	0	0	0	0	0	13	0	0	0	13
*30 *30 *30	0	0	0	0	0	0	0	0	1	1
*30 *30 *30	0	0	0	0	0	1	0	0	0	1
*30 *36	0	0	0	0	0	1	0	0	0	1
*30 4411191	0	0	0	0	0	2	0	0	0	2
*31 (Arcadia PD)	0	0	0	0	0	230	0	0	16	246
*31 *20	0	0	0	0	0	1	0	0	0	1
*31 *26	0	0	0	0	0	1	0	0	0	1
*32 (San Mar PD)	0	0	0	0	0	44	0	0	6	50
*33 (Si Madre PD)	0	0	0	0	0	7	0	0	0	7
*33 *34	0	0	0	0	0	1	0	0	0	1
*34 (Si Mad PD)	0	0	0	0	0	5	0	0	0	5
*36 (Verdugo Fire)	0	0	1	0	0	184	2	0	18	205
*36 *30	0	0	0	0	0	2	0	0	0	2
*36 4411191	0	0	0	0	0	1	0	0	0	1
*37 (Glendale Fire)	0	0	0	0	0	12	0	0	1	13
*38 (Alhambra PD)	0	0	1	0	0	114	0	0	7	122
*38 *23 *20	0	0	0	0	0	0	0	0	1	1
*38 *24	0	0	0	0	0	1	0	0	0	1
*38 *38	0	0	0	0	0	2	0	0	0	2
*39 (San Gab PD)	0	0	0	0	0	74	0	0	5	79
*40 (Monrovia PD)	0	0	0	0	0	77	0	0	5	82
*41 (El Monte PD)	1	0	0	0	0	60	0	0	10	71

⁶ Test calls made to CHP PSAP.

⁷ Test calls made to CHP PSAP.

LOS ANGELES CHP PSAP TRANSFERRED CALLS 8/24/98 - 1/03/99										
TRANSFERRED TO										
ESN (PSAP)⇒	119 (TC)	120 (PAS)	121 (SPAS)	123 (ARC)	124 (S.MAR)	125 (CHP)	497 ⁶ (TEST)	997 ⁷ (TEST)	UNKNOWN	Grand Total
*41 *41	0	0	0	0	0	2	0	0	0	2
*41 *41 *41 *41	0	0	0	0	0	0	0	0	1	1
*42 (Irwindale PD)	0	0	0	0	0	5	0	0	1	6
*42 *23	0	0	0	0	0	0	0	0	1	1
13232639411	0	0	0	0	0	2	0	0	0	2
3551414 (Si Mad PD)	0	0	0	0	0	9	0	0	0	9
4411191 (S Pasa PD)	0	0	0	0	0	72	0	0	4	76
4411191 4411191	0	0	0	0	0	1	0	0	0	1
4411191 4411191 441119	0	0	0	0	0	1	0	0	1	2
7924161 (Verd Fire)	0	0	0	0	0	1	0	0	3	4
7924161 7924161	0	0	0	0	0	1	0	0	1	2
7981131 (Alta. SO)	0	0	0	0	0	26	0	0	0	26
7981131 *30	0	0	0	0	0	2	0	0	0	2
TOTAL XFERED	2	0	2	0	0	2,035	2	0	206	2,247
NOT XFERED	8	78	30	10	2	9,537	13	2	1,604	11,284
% XFERED ⁸						17.6%			11.4%	
Grand Total	10	78	32	10	2	11572	15	2	1,810	13,531

Table 13

⁸Percentage of calls received directly at Los Angeles CHP PSAP and subsequently transferred. Most of the “unknown” calls are presumed to be CHP’s, so this figure (11.4%) is also listed.

Table 14 – Call Transfer Summary

Table 14 below summarizes call transfer data for all PSAPs. Of the 2,156 calls selectively routed, approximately 70 percent were routed to CHP and 30 percent to the participating PSAPs. Of the calls selectively routed to a PSAP other than CHP, 24 percent were transferred again, approximately half of them to CHP.

LOS ANGELES CHP TRANSFER RATES SELECTIVELY ROUTED VS. NON-SELECTIVELY ROUTED CALLS 8/24/99 – 1/03/99			
TYPE OF WIRELESS CALL	CALLS DELIVERED 1ST	CALLS TRANSFERRED	TRANSFER RATE
PCS Calls (Selectively Routed)	2,156	372	17.3 %
Cellular Calls (All Routed to CHP)	9,403	1,663	17.7 %
Total - PCS & Cellular Calls	11,559	2,035	17.6 %

Table 14

Appendix D

Maps of Trial Area

This map illustrates the Los Angeles metropolitan area, with a focus on the San Gabriel Valley region highlighted by a pink rectangle. The map shows major highways such as I-5, I-10, I-210, and SR-138. Key cities and towns labeled include Los Angeles, Glendale, Pasadena, San Marino, Arcadia, and West Covina. The map also depicts natural features like the San Gabriel River, Los Angeles River, and various parks including Griffith Park, San Gabriel Park, and San Marino Park. The pink box encompasses the area from approximately 34°15'N to 34°25'N latitude and 118°05'W to 118°15'W longitude, covering the San Gabriel Valley and parts of the Los Angeles basin.

LA TRIAL AREA-DETAILED

